



VENTILATORS

PPE Product Information for the COVID-19 Response

STANDARDS FOR ALL VENTILATORS

- Only high-purity compressed gaseous air, reconstituted synthetic air (blended 21% oxygen and 79% nitrogen), compressed gaseous oxygen, liquid air, or liquid oxygen shall be used for respiration. Compressed air or liquid air shall at least be Grade D air.
- The dew point temperature of compressed breathing air shall be lower than the temperature of the atmosphere in which atmosphere-supplying respirators are worn.
- Table A9.1 (below) lists dew point temperatures and their corresponding moisture contents for dew point temperatures.

TABLE A9.1 Dew Point Temperatures and Corresponding Moisture Content

°F	°C	ppm (v/v)	mg/m ³	°F	°C	ppm (v/v)	mg/m ³
-110	-78.9	0.6	0.4	-30	-34.4	235	173
-105	-76.1	1	0.7	-25	-31.7	316	233
100	-73.3	1.6	1.2	-20	-28.9	422	311
-95	-70.6	2	1.5	-15	-26.1	560	412
-90	-67.8	4	3	-10	-23.3	738	543
-85	-65.0	5	4	-5	-20.6	968	713
-80	-62.2	8	6	0	-17.8	1262	929
-75	-59.4	12	9	5	-15.0	1636	1204
-70	-56.7	17	13	10	-12.2	2109	1553
-65	-53.9	24	18	15	-9.4	2704	1991
-60	-51.1	34	25	20	-6.7	3450	2540
-55	-48.3	48	35	25	-3.9	4381	3225
-50	-45.6	67	49	30	-1.1	5537	4076
-45	-42.8	92	68	35	1.7	6850	5043
-40	-40.0	127	94	40	4.4	8353	6150
-35	-37.2	173	127	45	7.2	10 144	7468

N95-F RESPIRATORS

- The respirator must meet the flammability, fluid resistance, and biocompatibility requirements as approved by NIOSH for healthcare settings
- If an applicant has never previously submitted any type of respiratory protective device for NIOSH approval, the applicant must first apply to NIOSH for a three-character Manufacturer's Code by completing the Prospective Approval Holder Form and returning it to the NIOSH NPPTL Records Room. Obtain this form by contacting the NIOSH NPPTL Records Room at recordsroom@cdc.gov. After obtaining the Manufacturer's Code, the manufacturer seeking approval for an N95-F must follow this Guidance.
- Compressed gaseous air used in self-contained breathing apparatus shall have a maximum water content based on its cylinder pressure and the lowest anticipated storage or use temperature. Table A9.3 (see below) shall be used by manufacturers to determine the maximum water content for the pressure of the air cylinder for the lowest use temperature.
- Those manufacturing N95-F Respirators must sign an MOU with the FDA and undergo annual registration.

STANDARDS FOR ALL VENTILATORS CONT

TABLE A9.3 Moisture Content High-Pressure Compressed Air Cylinders

Maximum Water Content Measured at Atmospheric Dew Point and Temperature ppm (mL/m ³)	2216 psig (15.3 MPa)		Lowest Use Temperature 3000 psig (20.7MPa)		4500 psig (31.0 MPa)	
	°C	°F	°C	°F	°C	°F
27	-7	20	-6	23	-5	23
24	-8	19	-7	20	-7	20
21	-10	16	-9	18	-9	17
18	-11	13	-10	15	-10	15
15	-13	11	-12	12	-12	12
14	-14	8	-13	9	-14	9
12	-16	5	-15	6	-15	6
11	-18	2	-16	4	-17	3
9	-19	0	-18	1	-18	0
8	-20	-3	-19	-2	-20	-3
7	-22	-6	-21	-4	-22	-6
6	-23	-8	-22	-7	-23	-9
5	-24	-11	-24	-10	-25	-12
5	-26	-14	-25	-13	-26	-15
4	-27	-16	-27	-15	-28	-17
4	-29	-19	-29	-18	-30	-20
3	-30	-22	-30	-21	-31	-23
3	-32	-24	-32	-24	-33	-26
2	-33	-27	-33	-26	-34	-29

More Standards:

- Breathing air systems that use an oil-lubricated compressor or air compressors powered by internal combustion engines shall have a continuous carbon monoxide monitor with alarm detectable by the wearers. Breathing air systems adequately sized for the application (i.e., generates sufficient airflow to the respirator(s))
- Air pressure shall be controlled and monitored (i.e., regulator and gauge) where the respirator wearer connects to the system;
- Piping shall be made of corrosion-resistant materials such as stainless steel, carbon steel, black iron, or copper, which is suitable for the environment where installed;
- Internal surfaces shall be free of grease, oil, and applied coatings
- Care shall be taken to prevent contamination when handling or assembling components - designed to prevent cross contamination or backflow from non-breathing air or other gas systems by use of check valves
- Breathing air couplings at the point of attachment where the respirator wearer connects to the system should be:
 - Incompatible with outlets for non-respirable plant air or other systems to prevent inadvertent servicing of airline respirators with non-respirable gas
 - Equipped with suitable non-corrosive fittings
 - Labeled to avoid inadvertently disconnecting service lines
- System Components—A processing and distribution system for breathing air consists at minimum:
 - Grade D quality air
 - Compressor
 - Mechanical separator to remove liquid and particulate contaminants
- The National Institute for Occupational Safety and Health (NIOSH) is the U.S. Government agency responsible for the certification and approval of respiratory protective devices for occupational use. It also addresses quality assurance requirements for the manufacturing of respiratory protective equipment. Anybody can manufacture and sell any type of respiratory protective device, but only those that meet or exceed all of the requirements established in the 42 CFR 84 standards are acknowledged by NIOSH, and only those that have been NIOSH-certified can be marketed as a NIOSH-approved respirator.